

REMARKS

This amendment is responsive to the Office Action mailed on September 18, 2007. The office action issued by the Examiner and the citations referred to in the office action have been carefully considered. Claims 1 through 4 have been amended. Each of the pending claims has been amended to more clearly set forth Applicants' invention. Prompt reconsideration is therefore earnestly requested.

Claim Rejections under 35 USC § 102/103

Claims 1-4 stand rejected as anticipated by or, in the alternative, as obvious over each of Summers (WO 80/01999) or Swanston, et al. (EP0080326). Each of these references teach providing a helically traveling magnetic stirring field within a traveling melt. However, neither of these references, nor any other prior art teaching known to Applicants, teach or suggest using SuperWave excitation, i.e., use of hierarchically frequency and amplitude **modulated** current systems to generate hierarchically frequency- and amplitude- modulated helically traveling magnetic fields within a melt.

It is respectfully submitted that modulated systems of currents had never been thought of, much less tried, in metal melt applications prior to Applicants' invention. The significance of the application of SuperWaves, i.e., as now above claimed, is clearly demonstrated in Applicants' specification in the description of the invention. Support for the amendments to claims 2-4 is specifically set forth in paragraph [0011] and elsewhere in the specification as well as being shown in the drawing.

Referring to Applicants' specification, the theoretical advantages of Applicants' system of modulated currents over conventional un-modulated current systems is described at least in paragraphs [0054] through [0063]. Applicants' experimental results, shown in Figures 24, 25 and 26, for example, along with Paragraphs [0149] through [0152] demonstrate this difference compared to the stirring taught by such references as Summers and Swanston et al.

Applying the teachings of Summers and Swanston, in order to achieve increased mixing or finer grain structure in solidified melt, the input energy necessary would have to be increased. Thus, if one applied helically traveling current energies that are, for example, reduced by 20%, one would expect a corresponding reduction of mixing effectiveness within the melt. Surprisingly, in Applicants' tests with superwave modulated excitation at comparable current energies as with conventional techniques, instead of a the same or a reduction, as would conventionally be expected, an actual increase in mixing effectiveness was observed within the melt, as exemplified by the graphs of Figures 25 and 26.

Stated another way, Applicants can achieve comparable mixing results to the use of conventional un-modulated helically traveling magnetic fields, with an expenditure of much less energy, and hence achieve comparable mixing at substantially reduced cost. Conversely, Applicants can achieve substantial increases in mixing with the same expenditure of energy. These results are not obvious to one ordinarily skilled in the metal forming arts. One would expect to have to expend extra energy in order to achieve enhanced mixing. However, the opposite is the case when using Applicants' excitation methodology. Accordingly the undersigned asserts that the examiner has failed to set forth a *prima facie* case of obviousness. The claim rejections should be withdrawn.

Claim 1 has been amended to clarify that the magnetic fields generated are also frequency and amplitude modulated. Claims 2, 3 and 4 have been amended to more clearly recite the duration and progression in embodiments of Applicants' claimed invention.

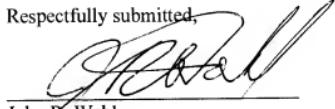
Claims 1-4 remain pending in the application. These claims are believed to clearly be patentable over the prior art. This Amendment is believed to be responsive to each and every point in the Office Action. Accordingly, prompt reconsideration and passage of the application to issue are earnestly requested.

Should any issues remain, the examiner is encouraged to contact the undersigned attorney by telephone at the number listed below in order to expeditiously resolve such issues or concerns. The Director is authorized to charge any additional fee(s) or any underpayment of

fee(s), or to credit any overpayments to **Deposit Account Number 50-2638**. Please ensure that Attorney Docket Number 061179-020000 is referred to when charging any payments or credits for this case.

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Respectfully submitted,


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